General

Guideline Title

Brief resolved unexplained events (formerly apparent life-threatening events) and evaluation of lower-risk infants.

Bibliographic Source(s)

Tieder JS, Bonkowsky JL, Etzel RA, Franklin WH, Gremse DA, Herman B, Katz ES, Krilov LR, Merritt JL 2nd, Norlin C, Percelay J, SapiÃ©n RE, Shiffman RN, Smith MB, Subcommittee on Apparent Life Threatening Events. Brief resolved unexplained events (formerly apparent life-threatening events) and evaluation of lower-risk infants. Pediatrics. 2016 May;137(5):e20160590. [128 references] PubMed

Guideline Status

This is the current release of the guideline.

All clinical practice guidelines from the American Academy of Pediatrics automatically expire 5 years after publication unless reaffirmed, revised, or retired at or before that time.

This guideline meets NGC's 2013 (revised) inclusion criteria.

Recommendations

Major Recommendations

Definitions for the quality of the evidence (A-D, X) and the strength of the recommendation (Strong, Moderate, Weak) are provided at the end of the "Major Recommendations" field.

Brief Resolved Unexplained Event (BRUE) Definition

Clinicians should use the term BRUE to describe an event occurring in an infant <1 year of age when the observer reports a sudden, brief, and now resolved episode of ≥1 of the following:

- Cyanosis or pallor
- Absent, decreased, or irregular breathing
- Marked change in tone (hyper or hypotonia)
- Altered level of responsiveness

Moreover, clinicians should diagnose a BRUE only when there is no explanation for a qualifying event after conducting an appropriate history and physical examination (see Tables 2 and 3 in the original guideline document).

Key Action Statements for Lower-Risk BRUE

1. Cardiopulmonary

1A. Clinicians need not admit infants presenting with a lower-risk BRUE to the hospital solely for cardiorespiratory monitoring (Grade B, Weak Recommendation)

Aggregate evidence quality: Grade B
Benefits: Reduce unnecessary testing and caregiver/infant anxiety; avoid consequences of false-positive result, health care– associated infections, and other patient safety risks
Risks, harm, cost: May rarely miss a recurrent event or diagnostic opportunity for rare underlying condition
Benefit-harm assessment: The benefits of reducing unnecessary testing, nosocomial infections, and false-positive results, as well as alleviating caregiver and infant anxiety, outweigh the rare missed diagnostic opportunity for an underlying condition
Intentional vagueness: None
Role of patient preferences: Caregiver anxiety and access to quality follow-up care may be important considerations in determining whether a hospitalization for cardiovascular monitoring is indicated
Exclusions: None
Strength: Weak recommendation (because of equilibrium between benefits and harms

1B. Clinicians may briefly monitor infants presenting with a lower-risk BRUE with continuous pulse oximetry and serial observations (Grade D, Weak Recommendation)

Aggregate evidence quality: Grade D
Benefits: Identification of hypoxemia
Risks, harm, cost: Increased costs due to monitoring over time and the use of hospital resources; false-positive results may lead to subsequent testing and hospitalization; false reassurance from negative test results
Benefit-harm assessment: The potential benefit of detecting hypoxemia outweighs the harm of cost and false results
Intentional vagueness: Duration of time to monitor patients with continuous pulse oximetry and the number and frequency of serial observations may vary
Role of patient preferences: Level of caregiver concern may influence the duration of oximetry monitoring
Exclusions: None
Strength: Weak recommendation (based on low quality of evidence)

1C. Clinicians should not obtain a chest radiograph in infants presenting with a lower-risk BRUE (Grade B, Moderate Recommendation)

Aggregate evidence quality: Grade B
Benefits: Reduce costs, unnecessary testing, radiation exposure, and caregiver/infant anxiety; avoid consequences of false-positive results
Risks, harm, cost: May rarely miss diagnostic opportunity for early lower respiratory tract or cardiac disease
Benefit-harm assessment: The benefits of reducing unnecessary testing, radiation exposure, and false-positive results, as well as alleviating caregiver and infant anxiety, outweigh the rare missed diagnostic opportunity for lower respiratory tract or cardiac disease
Intentional vagueness: None
Role of patient preferences: Caregiver may express concern regarding a longstanding breathing pattern in his/her infant or a recent change in breathing that might influence the decision to obtain chest radiography
Exclusions: None
Strength: Moderate recommendation

1D. Clinicians should not obtain measurement of venous or arterial blood gases in infants presenting with

a lower-risk BRUE (Grade B, Moderate Recommendation)

Aggregate evidence quality: Grade B
Benefits: Reduce costs, unnecessary testing, pain, risk of thrombosis, and caregiver/infant anxiety; avoid consequences of false-positive results
Risks, harm, cost: May miss rare instances of hypercapnia and acid-base imbalances
Benefit-harm assessment: The benefits of reducing unnecessary testing and false-positive results, as well as alleviating caregiver and infant anxiety, outweigh the rare missed diagnostic opportunity for hypercapnia and acid-base imbalances
Intentional vagueness: None
Role of patient preferences: None
Exclusions: None
Strength: Moderate recommendation

1E. Clinicians should not obtain an overnight polysomnograph in infants presenting with a lower-risk BRUE (Grade B, Moderate Recommendation)

Aggregate evidence quality: Grade B
Benefits: Reduce costs, unnecessary testing, and caregiver/infant anxiety; avoid consequences of false-positive results
Risks, harm, cost: May miss rare instances of hypoxemia, hypercapnia, and/or bradycardia that would be detected by polysomnography
Benefit-harm assessment: The benefits of reducing unnecessary testing and false-positive results, as well as alleviating caregiver and infant anxiety, outweigh the rare missed diagnostic opportunity for hypoxemia, hypercapnia, and/or bradycardia
Intentional vagueness: None
Role of patient preferences: Caregivers may report concern regarding some aspects of their infant's sleep pattern that may influence the decision to perform polysomnography
Exclusions: None
Strength: Moderate recommendation

1F. Clinicians may obtain a 12-lead electrocardiogram for infants presenting with lower-risk BRUE (Grade C, Weak Recommendation)

Aggregate evidence quality: Grade C
Benefits: May identify BRUE patients with channelopathies (long QT syndrome, short QT syndrome, and Brugada syndrome), ventricular preexcitation (Wolff-Parkinson-White syndrome), cardiomyopathy, or other heart disease
Risks, harm, cost: False-positive results may lead to further workup, expert consultation, anxiety, and cost; false reassurance from negative results; cost and availability of electrocardiography testing and interpretation
Benefit-harm assessment: The benefit of identifying patients at risk of sudden cardiac death outweighs the risk of cost and false results
Intentional vagueness: None
Role of patient preferences: Caregiver may decide not to have testing performed
Exclusions: None
Strength: Weak recommendation (because of equilibrium between benefits and harms)

1G. Clinicians should not obtain an echocardiogram in infants presenting with lower-risk BRUE (Grade C, Moderate Recommendation)

Aggregate evidence quality: Grade C
Benefits: Reduce costs, unnecessary testing, caregiver/infant anxiety, and sedation risk; avoid consequences of false-positive results
Risks, harm, cost: May miss rare diagnosis of cardiac disease
Benefit-harm assessment: The benefits of reducing unnecessary testing and sedation risk, as well as alleviating caregiver and infant anxiety, outweigh the rare missed diagnostic opportunity for cardiac

causes
Intentional vagueness: Abnormal cardiac physical examination reflects the clinical judgment of the clinician
Role of patient preferences: Some caregivers may prefer to have echocardiography performed
Exclusions: Patients with an abnormal cardiac physical examination
Strength: Moderate recommendation

1H. Clinicians should not initiate home cardiorespiratory monitoring in infants presenting with a lower-risk BRUE (Grade B, Moderate Recommendation)

Aggregate evidence quality: Grade B
Benefits: Reduce costs, unnecessary testing, and caregiver/infant anxiety; avoid consequences of false-positive results
Risks, harm, cost: May rarely miss an infant with recurrent central apnea or cardiac arrhythmias
Benefit-harm assessment: The benefits of reducing unnecessary testing and false-positive results, as well as alleviating caregiver and infant anxiety, outweigh the rare missed diagnostic opportunity for recurrent apnea or cardiac arrhythmias
Intentional vagueness: None
Role of patient preferences: Caregivers will frequently request monitoring be instituted after an apparent life-threatening event (ALTE) in their infant; a careful explanation of the limitations and disadvantages of this technology should be given
Exclusions: None
Strength: Moderate recommendation

2. Child Abuse

2A. Clinicians need not obtain neuroimaging (computed tomography, magnetic resonance imaging [MRI], or ultrasonography) to detect child abuse in infants presenting with a lower-risk BRUE (Grade C, Weak Recommendation)

Aggregate evidence quality: Grade C
Benefits: Decrease cost; avoid sedation, radiation exposure, consequences of false-positive results
Risks, harm, cost: May miss cases of child abuse and potential subsequent harm
Benefit-harm assessment: The benefits of reducing unnecessary testing, sedation, radiation exposure, and false-positive results, as well as alleviating caregiver and infant anxiety, outweigh the rare missed diagnostic opportunity for child abuse
Intentional vagueness: None
Role of patient preferences: Caregiver concerns may lead to requests for central nervous system (CNS) imaging
Exclusions: None
Strength: Weak recommendation (based on low quality of evidence)

2B. Clinicians should obtain an assessment of social risk factors to detect child abuse in infants presenting with a lower-risk BRUE (Grade C, Moderate Recommendation)

Aggregate evidence quality: Grade C
Benefits: Identification of child abuse; may benefit the safety of other children in the home; may identify other social risk factors and needs and help connect caregivers with appropriate resources (e.g., financial distress)
Risks, harm, cost: Resource intensive and not always available, particularly for smaller centers; some social workers may have inadequate experience in child abuse assessment; may decrease caregiver's trust in the medical team
Benefit-harm assessment: The benefits of identifying child abuse and identifying and addressing social needs outweigh the cost of attempting to locate the appropriate resources or decreasing the trust in the medical team
Intentional vagueness: None

Role of patient preferences: Caregivers may perceive social services involvement as unnecessary and intrusive
Exclusions: None
Strength: Moderate recommendation

3. Neurology

3A. Clinicians should not obtain neuroimaging (computed tomography, MRI, or ultrasonography) to detect neurologic disorders in infants presenting with a lower-risk BRUE (Grade C, Moderate Recommendation)

Aggregate evidence quality: Grade C
Benefits: Reduce unnecessary testing, radiation exposure, sedation, caregiver/infant anxiety, and costs; avoid consequences of false-positive results
Risks, harm, cost: May rarely miss diagnostic opportunity for CNS causes of BRUEs; may miss unexpected cases of abusive head trauma
Benefit-harm assessment: The benefits of reducing unnecessary testing, radiation exposure, sedation, and false-positive results, as well as alleviating caregiver and infant anxiety, outweigh the rare missed diagnostic opportunity for CNS cause
Intentional vagueness: None
Role of patient preferences: Caregivers may seek reassurance from neuroimaging and may not understand the risks from radiation and sedation
Exclusions: None
Strength: Moderate recommendation

3B. Clinicians should not obtain an electroencephalogram (EEG) to detect neurologic disorders in infants presenting with a lower-risk BRUE (Grade C, Moderate Recommendation)

Aggregate evidence quality: Grade C
Benefits: Reduce unnecessary testing, sedation, caregiver/infant anxiety, and costs; avoid consequences of false-positive or nonspecific results
Risks, harm, cost: Could miss early diagnosis of seizure disorder
Benefit-harm assessment: The benefits of reducing unnecessary testing, sedation, and false-positive results, as well as alleviating caregiver and infant anxiety, outweigh the rare missed diagnostic opportunity for epilepsy
Intentional vagueness: None
Role of patient preferences: Caregivers may seek reassurance from an EEG, but they may not appreciate study limitations and the potential of false-positive results
Exclusions: None
Strength: Moderate recommendation

3C. Clinicians should not prescribe antiepileptic medications for potential neurologic disorders in infants presenting with a lower-risk BRUE (Grade C, Moderate Recommendation)

Aggregate evidence quality: Grade C
Benefits: Reduce medication adverse effects and risks, avoid treatment with unproven efficacy, and reduce cost
Risks, harm, cost: Delay in treatment of epilepsy could lead to subsequent BRUE or seizure
Benefit-harm assessment: The benefits of reducing medication adverse effects, avoiding unnecessary treatment, and reducing cost outweigh the risk of delaying treatment of epilepsy
Intentional vagueness: None
Role of patient preferences: Caregivers may feel reassured by starting a medicine but may not understand the medication risks
Exclusions: None
Strength: Moderate recommendation

4. Infectious Diseases

4A. Clinicians should not obtain a white blood cell count, blood culture, or cerebrospinal fluid analysis or culture to detect an occult bacterial infection in infants presenting with a lower-risk BRUE (Grade B, Strong Recommendation)

Aggregate evidence quality: Grade B
Benefits: Reduce unnecessary testing, pain, exposure, caregiver/infant anxiety, and costs; avoid unnecessary antibiotic use and hospitalization pending culture results; avoid consequences of false-positive results/contaminants
Risks, harm, cost: Could miss serious bacterial infection at presentation
Benefit-harm assessment: The benefits of reducing unnecessary testing, pain, exposure, costs, unnecessary antibiotic use, and false-positive results, as well as alleviating caregiver and infant anxiety, outweigh the rare missed diagnostic opportunity for a bacterial infection
Intentional vagueness: None
Role of patient preferences: Caregiver concerns over possible infectious etiology may lead to requests for antibiotic therapy
Exclusions: None
Strength: Strong recommendation

4B. Clinicians need not obtain a urinalysis (bag or catheter) in infants presenting with a lower-risk BRUE (Grade C, Weak Recommendation)

Aggregate evidence quality: Grade C
Benefits: Reduce unnecessary testing, pain, iatrogenic infection, caregiver/infant anxiety, and costs; avoid consequences of false-positive results; avoid delay from time it takes to obtain a bag urine
Risks, harm, cost: May delay diagnosis of infection
Benefit-harm assessment: The benefits of reducing unnecessary testing, iatrogenic infection, pain, costs, and false-positive results, as well as alleviating caregiver and infant anxiety, outweigh the rare missed diagnostic opportunity for a urinary tract infection
Intentional vagueness: None
Role of patient preferences: Caregiver concerns may lead to preference for testing
Exclusions: None
Strength: Weak recommendation (based on low quality of evidence)

4C. Clinicians should not obtain a chest radiograph to assess for pulmonary infection in infants presenting with a lower-risk BRUE (Grade B, Moderate Recommendation)

Aggregate evidence quality: Grade B
Benefits: Reduce costs, unnecessary testing, radiation exposure, and caregiver/infant anxiety; avoid consequences of false-positive results
Risks, harm, cost: May miss early lower respiratory tract infection
Benefit-harm assessment: The benefits of reducing unnecessary testing, radiation exposure, and false-positive results, as well as alleviating caregiver and infant anxiety, outweigh the rare missed diagnostic opportunity for pulmonary infection
Intentional vagueness: None
Role of patient preferences: Caregiver concerns may lead to requests for a chest radiograph
Exclusions: None
Strength: Moderate recommendation

4D. Clinicians need not obtain respiratory viral testing if rapid testing is available in infants presenting with a lower-risk BRUE (Grade C, Weak Recommendation)

Aggregate evidence quality: Grade C
Benefits: Reduce costs, unnecessary testing, and caregiver/infant discomfort; avoid false-negative result leading to missed diagnosis and false reassurance
Risks, harm, cost: Failure to diagnose a viral etiology; not providing expectant management for progression and appropriate infection control interventions for viral etiology

Benefit-harm assessment: The benefits of reducing unnecessary testing, pain, costs, false reassurance, and false-positive results, as well as alleviating caregiver and infant anxiety and challenges associated with providing test results in a timely fashion, outweigh the rare missed diagnostic opportunity for a viral infection
Intentional vagueness: "Rapid testing"; time to results may vary
Role of patient preferences: Caregiver may feel reassured by a specific viral diagnosis
Exclusions: None
Strength: Weak recommendation (based on low-quality evidence)

4E. Clinicians may obtain testing for pertussis in infants presenting with a lower-risk BRUE (Grade B, Weak Recommendation)

Aggregate evidence quality: Grade B
Benefits: Identify a potentially treatable infection; monitor for progression of symptoms, additional apneic episodes; potentially prevent secondary spread and/or identify and treat additional cases
Risks, harm, cost: Cost of test; discomfort of nasopharyngeal swab; false-negative results leading to missed diagnosis and false reassurance; rapid testing not always available; false reassurance from negative results
Benefit-harm assessment: The benefits of identifying and treating pertussis and preventing apnea and secondary spread outweigh the cost, discomfort, and consequences of false test results and false reassurance; the benefits are greatest in at-risk populations (exposed, underimmunized, endemic, and during outbreaks)
Intentional vagueness: None
Role of patient preferences: Caregiver may feel reassured if a diagnosis is obtained and treatment can be implemented
Exclusions: None
Strength: Weak recommendation (based on balance of benefit and harm)

5. Gastroenterology

5A. Clinicians should not obtain investigations for gastroesophageal reflux (GER) (e.g., upper gastrointestinal series, pH probe, endoscopy, barium contrast study, nuclear scintigraphy, and ultrasonography) in infants presenting with a lower-risk BRUE (Grade C, Moderate Recommendation)

Aggregate evidence quality: Grade C
Benefits: Reduce unnecessary testing, procedural complications (sedation, intestinal perforation, bleeding), pain, radiation exposure, caregiver/infant anxiety, and costs; avoid consequences of false-positive results
Risks, harm, cost: Delay diagnosis of rare but serious gastrointestinal abnormalities (e.g., tracheoesophageal fistula); long-term morbidity of repeated events (e.g., chronic lung disease)
Benefit-harm assessment: The benefits of reducing unnecessary testing, complications, radiation, pain, costs, and false-positive results, as well as alleviating caregiver and infant anxiety, outweigh the rare missed diagnostic opportunity for a gastrointestinal abnormality or morbidity from repeat events
Intentional vagueness: None
Role of patient preferences: Caregiver may be reassured by diagnostic evaluation of GER
Exclusions: None
Strength: Moderate recommendation

5B. Clinicians should not prescribe acid suppression therapy for infants presenting with a lower-risk BRUE (Grade C, Moderate Recommendation)

Aggregate evidence quality: Grade C
Benefits: Reduce unnecessary medication use, adverse effects, and cost from treatment with unproven efficacy
Risks, harm, cost: Delay treatment of rare but undiagnosed gastrointestinal disease, which could lead to complications (e.g., esophagitis)

Benefit-harm assessment: The benefits of reducing medication adverse effects, avoiding unnecessary treatment, and reducing cost outweigh the risk of delaying treatment of gastrointestinal disease
Intentional vagueness: None
Role of patient preferences: Caregiver concerns may lead to requests for treatment
Exclusions: None
Strength: Moderate recommendation

6. Inborn Errors of Metabolism (IEM)

6A. Clinicians need not obtain measurement of serum lactic acid or serum bicarbonate to detect an IEM in infants presenting with a lower-risk BRUE (Grade C, Weak Recommendation)

Aggregate evidence quality: Grade C
Benefits: Reduce unnecessary testing, caregiver/infant anxiety, and costs; avoid consequences of false-positive or nonspecific results
Risks, harm, cost: May miss detection of an IEM
Benefit-harm assessment: The benefits of reducing unnecessary testing, cost, and false-positive results, as well as alleviating caregiver and infant anxiety, outweigh the rare missed diagnostic opportunity for an IEM
Intentional vagueness: Detection of higher lactic acid or lower bicarbonate levels should be considered to have a lower likelihood of being a false positive result and may warrant additional investigation
Role of patient preferences: Caregiver concerns may lead to requests for diagnostic testing
Exclusions: None
Strength: Weak recommendation (based on low-quality evidence)

6B. Clinicians should not obtain a measurement of serum sodium, potassium, chloride, blood urea nitrogen, creatinine, calcium, or ammonia to detect an IEM on infants presenting with a lower-risk BRUE (Grade C, Moderate Recommendation)

Aggregate evidence quality: Grade C
Benefits: Reduce costs, unnecessary testing, pain, and caregiver/infant anxiety; avoid consequences of false-positive results
Risks, harm, cost: May miss detection of an IEM
Benefit-harm assessment: The benefits of reducing unnecessary testing, cost, and false-positive results, as well as alleviating caregiver and infant anxiety, outweigh the rare missed diagnostic opportunity for an IEM
Intentional vagueness: None
Role of patient preferences: Caregiver concerns may lead to requests for diagnostic testing
Exclusions: None
Strength: Moderate recommendation

6C. Clinicians should not obtain a measurement of venous or arterial blood gases to detect an IEM in infants presenting with lower-risk BRUE (Grade C, Moderate Recommendation)

Aggregate evidence quality: Grade C
Benefits: Reduce costs, unnecessary testing, pain, risk of thrombosis, and caregiver/infant anxiety; avoid consequences of false-positive results
Risks, harm, cost: May miss detection of an IEM
Benefit-harm assessment: The benefits of reducing unnecessary testing, cost, and false-positive results, as well as alleviating caregiver and infant anxiety, outweigh the rare missed diagnostic opportunity for an IEM
Intentional vagueness: None
Role of patient preferences: Caregiver concerns may lead to requests for diagnostic testing
Exclusions: None
Strength: Moderate recommendation

6D. Clinicians need not obtain a measurement of blood glucose to detect an IEM in infants presenting with a lower-risk BRUE (Grade C, Weak Recommendation)

Aggregate evidence quality: Grade C
Benefits: Reduce costs, unnecessary testing, pain, risk of thrombosis, and caregiver/infant anxiety; avoid consequences of false-positive results
Risks, harm, cost: May miss rare instances of hypoglycemia attributable to undiagnosed IEM
Benefit-harm assessment: The benefits of reducing unnecessary testing, cost, and false positive results, as well as alleviating caregiver and infant anxiety, outweigh the rare missed diagnostic opportunity for an IEM
Intentional vagueness: Measurement of glucose is often performed immediately through a simple bedside test; no abnormalities have been reported in asymptomatic infants, although studies often do not distinguish between capillary or venous measurement
Role of patient preferences: Caregiver concerns may lead to requests for diagnostic testing
Exclusions: None
Strength: Weak recommendation (based on low-quality evidence)

6E. Clinicians should not obtain measurements of urine organic acids, plasma amino acids, or plasma acylcarnitines to detect an IEM in infants presenting with a lower-risk BRUE (Grade C, Moderate Recommendation)

Aggregate evidence quality: Grade C
Benefits: Reduce costs, unnecessary testing, pain, risk of thrombosis, and caregiver/infant anxiety; avoid consequences of false-positive results
Risks, harm, cost: May miss detection of an IEM
Benefit-harm assessment: The benefits of reducing unnecessary testing, cost, and false-positive results, as well as alleviating caregiver and infant anxiety, outweigh the rare missed diagnostic opportunity for an IEM
Intentional vagueness: Lower-risk BRUEs will have a very low likelihood of disease, but these tests may be indicated in rare cases in which there is no documentation of a newborn screen being performed
Role of patient preferences: Caregiver concerns may lead to requests for diagnostic testing
Exclusions: None
Strength: Moderate recommendation

7. Anemia

7A. Clinicians should not obtain laboratory evaluation for anemia in infants presenting with a lower-risk BRUE (Grade C, Moderate Recommendation)

Aggregate evidence quality: Grade C
Benefits: Reduce costs, unnecessary testing, pain, risk of thrombosis, and caregiver/infant anxiety; avoid consequences of false-positive results
Risks, harm, cost: May miss diagnosis of anemia
Benefit-harm assessment: The benefits of reducing unnecessary testing, cost, and false-positive results, as well as alleviating caregiver and infant anxiety, outweigh the missed diagnostic opportunity for anemia
Intentional vagueness: None
Role of patient preferences: Caregivers may be reassured by testing
Exclusions: None
Strength: Moderate recommendation

8. Patient- and Family-Centered Care

8A. Clinicians should offer resources for cardiopulmonary resuscitation (CPR) training to caregivers (Grade C, Moderate Recommendation)

Aggregate evidence quality: Grade C
Benefits: Decrease caregiver anxiety and increase confidence; benefit to society
Risks, harm, cost: May increase caregiver anxiety; cost and availability of training
Benefit-harm assessment: The benefits of decreased caregiver anxiety and increased confidence, as well as societal benefits, outweigh the increase in caregiver anxiety, cost, and resources
Intentional vagueness: None
Role of patient preferences: Caregiver may decide not to seek out the training
Exclusions: None
Strength: Moderate recommendation

8B. Clinicians should educate caregivers about BRUEs (Grade C, Moderate Recommendation)

Aggregate evidence quality: Grade C
Benefits: Improve caregiver empowerment and health literacy and decrease anxiety; may reduce unnecessary return visits; promotion of the medical home
Risks, harm, cost: Increase caregiver anxiety and potential for caregiver intimidation in voicing concerns; increase health care costs and length of stay
Benefit-harm assessment: The benefits of decreased caregiver anxiety and increased empowerment and health literacy outweigh the increase in cost, length of stay, and caregiver anxiety and intimidation
Intentional vagueness: None
Role of patient preferences: Caregiver may decide not to listen to clinician
Exclusions: None
Strength: Moderate recommendation

8C. Clinicians should use shared decision-making for infants presenting with a lower-risk BRUE (Grade C, Moderate Recommendation)

Aggregate evidence quality: Grade C
Benefits: Improve caregiver empowerment and health literacy and decrease anxiety; may reduce unnecessary return visits; promotion of the medical home
Risks, harm, cost: Increase cost, length of stay, and caregiver anxiety and intimidation in voicing concerns
Benefit-harm assessment: The benefits of decreased caregiver anxiety and unplanned return visits and increased empowerment, health, literacy, and medical home promotion outweigh the increase in cost, length of stay, and caregiver anxiety and information
Intentional vagueness: None
Role of patient preferences: Caregiver may decide not to listen to clinician
Exclusions: None
Strength: Moderate recommendation

Definitions

Evidence Quality

Aggregate Evidence Quality	Benefit or Harm Predominates	Benefit and Harm Balanced
Level A Intervention: Well-designed and conducted trials, meta-analyses on applicable populations Diagnosis: Independent gold standard studies of applicable populations	Strong recommendation	Weak Recommendation (based on balance of benefit and harm)
Level B Trials or diagnostic studies with minor limitations; consistent findings from multiple observational studies	Strong recommendation/Moderate recommendation	

Aggregate Evidence Quality	Benefit or Harm Predominates	Benefit and Harm Balanced
Level C Single or few observational studies or multiple studies with inconsistent findings or major limitations	Moderate recommendation/Weak recommendation (based on low quality evidence)	
Level D Expert opinion, case reports, reasoning from first principles	Weak recommendation (based on low quality evidence)	No recommendation may be made
Level X Exceptional situations where validating studies cannot be performed and there is a clear preponderance of benefit or harm	Strong recommendation/Moderate recommendation	

Definitions for Key Action Statements

Statement	Definition	Implication
Strong recommendation	A particular action is favored because anticipated benefits clearly exceed harms (or vice versa), and quality of evidence is excellent or unobtainable.	Clinicians should follow a strong recommendation unless a clear and compelling rationale for an alternative approach is present.
Moderate recommendation	A particular action is favored because anticipated benefits clearly exceed harms (or vice versa), and the quality of evidence is good but not excellent (or is unobtainable).	Clinicians would be prudent to follow a moderate recommendation but should remain alert to new information and sensitive to patient preferences.
Weak recommendation (based on low-quality evidence)	A particular action is favored because anticipated benefits clearly exceed harms (or vice versa), but the quality of evidence is weak.	Clinicians would be prudent to follow a weak recommendation but should remain alert to new information and very sensitive to patient preferences.
Weak recommendation (based on balance of benefits and harms)	Weak recommendation is provided when the aggregate database shows evidence of both benefit and harm that appear similar in magnitude for any available courses of action.	Clinicians should consider the options in their decision making, but patient preference may have a substantial role.

Clinical Algorithm(s)

An algorithm titled "Diagnosis, risk classification, and recommended management of a BRUE" is provided original guideline document.

Scope

Disease/Condition(s)

Brief resolved unexplained events (BRUE) marked by sudden, brief, and now resolved episode of ≥1 of the following:

- Cyanosis or pallor
- Absent, decreased, or irregular breathing
- Marked change in tone (hyper- or hypotonia)
- Altered level of responsiveness

Guideline Category

Evaluation

Management

Risk Assessment

Clinical Specialty

Emergency Medicine

Family Practice

Pediatrics

Intended Users

Advanced Practice Nurses

Hospitals

Nurses

Physician Assistants

Physicians

Guideline Objective(s)

- To recommend the replacement of the term apparent life-threatening event (ALTE) with a new term, brief resolved unexplained event (BRUE)
- To provide an approach to patient evaluation that is based on the risk that the infant will have a recurring event or has a serious underlying disorder
- To provide evidence-based management recommendations, or key action statements, for lower-risk patients whose history and physical examination are normal
- To provide implementation support and suggest directions for future research

Target Population

Infants less than 1 year of age presenting with lower-risk brief, resolved unexplained event (BRUE)

Note: This guideline does not offer recommendations for higher-risk patients whose history and physical examination suggest the need for further investigation and treatment (because of insufficient evidence or the availability of clinical practice guidelines specific to their presentation).

Interventions and Practices Considered

1. Diagnosis of brief resolved unexplained events (BRUEs)
    - Appropriate history
    - Physical examination
2. Cardiopulmonary evaluation*
    - Admission to the hospital solely for cardiorespiratory monitoring
    - Brief monitoring with continuous pulse oximetry and serial observations
    - Chest radiograph
    - Measurement of venous or arterial blood gas
    - Overnight polysomnograph
    - 2-lead electrocardiogram
    - Echocardiogram

    - Home cardiorespiratory monitoring
3. Child abuse evaluation*
    - Neuroimaging (computed tomography [CT], magnetic resonance imaging [MRI], or ultrasonography)
    - Assessment of social risk factors
4. Neurologic evaluation*
    - Neuroimaging (CT, MRI, or ultrasonography)
    - Electroencephalogram (EEG)
    - Antiepileptic medications
5. Infectious disease evaluation*
    - White blood cell (WBC) count, blood culture, or cerebrospinal fluid analysis or culture to detect an occult bacterial infection
    - Urinalysis (bag or catheter)
    - Chest radiograph to assess for pulmonary infection
    - Respiratory viral testing if rapid testing is available
    - Testing for pertussis
6. Gastrointestinal evaluation*
    - Investigations for gastroesophageal reflux (GER) (e.g., upper gastrointestinal tract series, pH probe, endoscopy, barium contrast study, nuclear scintigraphy, and ultrasonography)
    - Acid suppression therapy
7. Inborn errors of metabolism (IEM) evaluation*
    - Measurement of serum lactic acid or serum bicarbonate
    - Measurement of serum sodium, potassium, chloride, blood urea nitrogen, creatinine, calcium, or ammonia
    - Measurement of venous or arterial blood gases
    - Measurement of blood glucose
    - Measurement of urine organic acids, plasma amino acids, or plasma acylcarnitines
8. Laboratory evaluation for anemia*
9. Patient- and family-centered care
    - Offering resources for cardiopulmonary resuscitation (CPR) training to caregivers
    - Educating caregivers about BRUEs
    - Use of shared decision-making

*Note: Many of the listed interventions for evaluation of BRUEs are not recommended based on the balance of benefits and harms and the quality of the evidence. Please see the "Major Recommendations" field for context.

Major Outcomes Considered

- Diagnosis of underlying disorder
- Morbidity
- Mortality
- Need for hospitalization
- Details of past medical history (PMH), history of present illness (HPI), physical examination (PE)
- Sensitivity and positive predictive value of diagnostic testing
- Critical care work-up
- Recurrence risk
- Discharge diagnosis
- Long-term outcomes of apparent life-threatening events (ALTEs)
- Relevance of gastrointestinal (GI)/gastroesophageal reflux disease (GERD)

Methodology

Methods Used to Collect/Select the Evidence

Searches of Electronic Databases

Description of Methods Used to Collect/Select the Evidence

The subcommittee performed a comprehensive review of the literature related to apparent life-threatening events (ALTEs) from 1970 through 2014. Articles from 1970 through 2011 were identified and evaluated by using "Management of Apparent Life-Threatening Events in Infants: A Systematic Review," authored by the Society of Hospital Medicine's ALTE Expert Panel (which included 4 members of the subcommittee). The subcommittee partnered with the Society of Hospital Medicine Expert Panel and a librarian to update the original systematic review with articles published through December 31, 2014, with the use of the same methodology as the original systematic review. PubMed, Cumulative Index to Nursing and Allied Health Literature, and Cochrane Library databases were searched for studies involving children younger than 24 months by using the stepwise approach specified in the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement. Search terms included "ALTE(s)," "apparent life threatening event(s)," "life threatening event(s)," "near miss SIDS" or "near miss sudden infant death syndrome," "aborted crib death" or "aborted sudden infant death syndrome," and "aborted SIDS" or "aborted cot death" or "infant death, sudden." The Medical Subject Heading "infantile apparent life threatening event," introduced in 2011, was also searched but did not identify additional articles.

In updating the systematic review published in 2012, pairs of 2 subcommittee members used validated methodology to independently score the newly identified abstracts from English language articles (n=120) for relevance to the clinical questions (Supplemental Fig. 3 in the Supplemental Information [see the "Availability of Companion Documents" field]).

Number of Source Documents

The final recommendations were based on 55 articles identified in the updated (n=18) and original (n=37) systematic reviews.

Methods Used to Assess the Quality and Strength of the Evidence

Weighting According to a Rating Scheme (Scheme Given)

Rating Scheme for the Strength of the Evidence

Aggregate Evidence Quality	Benefit or Harm Predominates	Benefit and Harm Balanced
Level A Intervention: Well-designed and conducted trials, meta-analyses on applicable populations Diagnosis: Independent gold standard studies of applicable populations	Strong recommendation	Weak Recommendation (based on balance of benefit and harm)
Level B Trials or diagnostic studies with minor limitations; consistent findings from multiple observational studies	Strong recommendation/Moderate recommendation	
Level C Single or few observational studies or multiple studies with inconsistent findings or major limitations	Moderate recommendation/Weak recommendation (based on low quality evidence)	
Level D Expert opinion, case reports, reasoning from	Weak recommendation (based on low quality evidence)	No recommendation may be made

Aggregate Evidence Quality	Benefit or Harm Predominates	Benefit and Harm Balanced
first principles Level X Exceptional situations where validating studies cannot be performed and there is a clear preponderance of benefit or harm	Strong recommendation/Moderate recommendation	

Methods Used to Analyze the Evidence

Systematic Review with Evidence Tables

Description of the Methods Used to Analyze the Evidence

Two independent reviewers critically appraised the full text of the newly identified articles (n=23) using a structured data collection form based on published guidelines for evaluating medical literature. They recorded each study's relevance to the clinical question, research design, setting, time period covered, sample size, patient eligibility criteria, data source, variables collected, key results, study limitations, potential sources of bias, and stated conclusions. If at least 1 reviewer judged an article to be relevant on the basis of the full text, subsequently at least 2 reviewers critically appraised the article and determined by consensus what evidence, if any, should be cited in the systematic review. Selected articles used in the earlier review were also reevaluated for their quality. The final recommendations were based on articles identified in the updated (n=18) and original (n=37) systematic review (Supplemental Table 7 in the Supplemental Information [see the "Availability of Companion Documents" field]).

Methods Used to Formulate the Recommendations

Expert Consensus

Description of Methods Used to Formulate the Recommendations

In July 2013, the American Academy of Pediatrics (AAP) convened a multidisciplinary subcommittee composed of primary care clinicians and experts in the fields of general pediatrics, hospital medicine, emergency medicine, infectious diseases, child abuse, sleep medicine, pulmonary medicine, cardiology, neurology, biochemical genetics, gastroenterology, environmental health, and quality improvement. The subcommittee also included a parent representative, a guideline methodologist/informatician, and an epidemiologist skilled in systematic reviews. The subcommittee performed a comprehensive review of the literature related to apparent life-threatening events (ALTEs) from 1970 through 2014.

The resulting systematic review was used to develop the guideline recommendations by following the policy statement from the AAP Steering Committee on Quality Improvement and Management, "Classifying Recommendations for Clinical Practice Guidelines." Decisions and the strength of recommendations were based on a systematic grading of the quality of evidence from the updated literature review by 2 independent reviewers and incorporation of a previous systematic review. Expert consensus was used when definitive data were not available. If committee members disagreed with the rest of the consensus, they were encouraged to voice their concern until full agreement was reached. If full agreement could not be reached, each committee member reserved the right to state concern or disagreement in the publication (which did not occur). Because the recommendations of this guideline were based on the ALTE literature, the subcommittee relied on the studies and outcomes that could be attributable to the new definition of lower- or higher-risk brief resolved unexplained event (BRUE) patients.

Key action statements were generated by using BRIDGE-Wiz (Building Recommendations in a Developers Guideline Editor), an interactive software tool that leads guideline development teams through a series of questions that are intended to create clear, transparent, and actionable key action statements. BRIDGE-Wiz integrates the quality of available evidence and a benefit harm assessment into the final

determination of the strength of each recommendation. Evidence-based guideline recommendations from the AAP may be graded as strong, moderate, weak based on low-quality evidence, or weak based on balance between benefits and harms. Strong and moderate recommendations are associated with "should" and "should not" recommendation statements, whereas weak recommendation may be recognized by use of "may" or "need not" (see the "Rating Scheme for the Strength of the Recommendations" field).

Rating Scheme for the Strength of the Recommendations

Definitions for Key Action Statements

Statement	Definition	Implication
Strong recommendation	A particular action is favored because anticipated benefits clearly exceed harms (or vice versa), and quality of evidence is excellent or unobtainable.	Clinicians should follow a strong recommendation unless a clear and compelling rationale for an alternative approach is present.
Moderate recommendation	A particular action is favored because anticipated benefits clearly exceed harms (or vice versa), and the quality of evidence is good but not excellent (or is unobtainable).	Clinicians would be prudent to follow a moderate recommendation but should remain alert to new information and sensitive to patient preferences.
Weak recommendation (based on low-quality evidence)	A particular action is favored because anticipated benefits clearly exceed harms (or vice versa), but the quality of evidence is weak.	Clinicians would be prudent to follow a weak recommendation but should remain alert to new information and very sensitive to patient preferences.
Weak recommendation (based on balance of benefits and harms)	Weak recommendation is provided when the aggregate database shows evidence of both benefit and harm that appear similar in magnitude for any available courses of action.	Clinicians should consider the options in their decision making, but patient preference may have a substantial role.

Cost Analysis

The guideline developers reviewed a published cost analysis.

Method of Guideline Validation

External Peer Review

Internal Peer Review

Description of Method of Guideline Validation

The practice guideline underwent a comprehensive review by stakeholders before formal approval by the American Academy of Pediatrics (AAP), including AAP councils, committees, and sections; selected outside organizations; and individuals identified by the subcommittee as experts in the field. All comments were reviewed by the subcommittee and incorporated into the final guideline when appropriate.

Evidence Supporting the Recommendations

Type of Evidence Supporting the Recommendations

The type of supporting evidence is identified and graded for each recommendation (see the "Major Recommendations" field).

Benefits/Harms of Implementing the Guideline Recommendations

Potential Benefits

The guideline is intended to foster a patient- and family-centered approach to care, reduce unnecessary and costly medical interventions, improve patient outcomes, support implementation, and provide direction for future research. See the "Major Recommendations" field for benefits of specific interventions considered in the guideline.

Potential Harms

See the "Major Recommendations" field for potential risks and harms of specific interventions considered in the guideline.

Qualifying Statements

Qualifying Statements

- This guideline may be of interest to parents and payers, but it is not intended to be used for reimbursement or to determine insurance coverage. This guideline is not intended as the sole source of guidance in the evaluation and management of brief resolved unexplained events (BRUEs) but rather is intended to assist clinicians by providing a framework for clinical decision-making.
- The guidance in this report does not indicate an exclusive course of treatment or serve as a standard of medical care. Variations, taking into account individual circumstances, may be appropriate.

Implementation of the Guideline

Description of Implementation Strategy

Dissemination and Implementation

Dissemination and implementation efforts are needed to facilitate guideline use across pediatric medicine, family medicine, emergency medicine, research, and patient/family communities. The following general approaches and a Web-based toolkit are proposed for the dissemination and implementation of this guideline.

Education

Education will be partially achieved through the American Academy of Pediatrics (AAP) communication outlets and educational services (*AAP News*, *Pediatrics*, and PREP). Further support will be sought from stakeholder organizations (American Academy of Family Physicians, American College of Emergency Physicians, American Board of Pediatrics, Society of Hospital Medicine). A Web-based toolkit (to be published online) will include caregiver handouts and a shared decision-making tool to facilitate patient-

and family-centered care. Efforts will address appropriate disease classification and diagnosis coding.

Integration of Clinical Workflow

An algorithm is provided (Figure 1 in the original guideline document) for diagnosis and management. Structured history and physical examination templates also are provided to assist in addressing all of the relevant risk factors for brief resolved unexplained events (BRUEs) (see Tables 2 and 3 in the original guideline document). Order sets and modified documents will be hosted on a Web-based learning platform that promotes crowd-sourcing.

Administrative and Research

International Classification of Diseases, 9th Revision, and International Classification of Diseases, 10th Revision, diagnostic codes are used for billing, quality improvement, and research; and new codes for lower- and higher-risk BRUEs will need to be developed. In the interim, the current code for an apparent life-threatening event (ALTE) (799.82) will need to be used for billing purposes. Efforts will be made to better reflect present knowledge and to educate clinicians and payers in appropriate use of codes for this condition.

Quality Improvement

Quality improvement initiatives that provide Maintenance of Certification credit, such as the AAP's PREP and EQIPP courses, or collaborative opportunities through the AAP's Quality Improvement Innovation Networks, will engage clinicians in the use and improvement of the guideline. By using proposed quality measures, adherence and outcomes can be assessed and benchmarked with others to inform continual improvement efforts. Proposed measures include process evaluation (use of definition and evaluation), outcome assessment (family experience and diagnostic outcomes), and balancing issues (cost and length of visit). Future research will need to be conducted to validate any measures.

Implementation Tools

Clinical Algorithm

Foreign Language Translations

Patient Resources

Quick Reference Guides/Physician Guides

Resources

For information about availability, see the *Availability of Companion Documents* and *Patient Resources* fields below.

Institute of Medicine (IOM) National Healthcare Quality Report Categories

IOM Care Need

Getting Better

Staying Healthy

IOM Domain

Effectiveness

Patient-centeredness

Identifying Information and Availability

Bibliographic Source(s)

Tieder JS, Bonkowsky JL, Etzel RA, Franklin WH, Gremse DA, Herman B, Katz ES, Krilov LR, Merritt JL 2nd, Norlin C, Percelay J, SapiÃ©n RE, Shiffman RN, Smith MB, Subcommittee on Apparent Life Threatening Events. Brief resolved unexplained events (formerly apparent life-threatening events) and evaluation of lower-risk infants. Pediatrics. 2016 May;137(5):e20160590. [128 references] PubMed

Adaptation

Not applicable: The guideline was not adapted from another source.

Date Released

2016 May

Guideline Developer(s)

American Academy of Pediatrics - Medical Specialty Society

Source(s) of Funding

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Guideline Committee

Subcommittee on Brief Resolved Unexplained Events (BRUEs) (formerly referred to as apparent life-threatening events [ALTEs]) (Oversight by the Council on Quality Improvement and Patient Safety)

Composition of Group That Authored the Guideline

Subcommittee Members: Joel S. Tieder, MD, MPH, FAAP (*Chair*); Joshua L. Bonkowsky, MD, PhD, FAAP, Pediatric Neurologist; Ruth A. Etzel, MD, PhD, FAAP, Pediatric Epidemiologist; Wayne H. Franklin, MD, MPH, MMM, FAAP, Pediatric Cardiologist; David A. Gremse, MD, FAAP, Pediatric Gastroenterologist; Bruce Herman, MD, FAAP, Child Abuse and Neglect; Eliot Katz, MD, FAAP, Pediatric Pulmonologist; Leonard R. Krilov, MD, FAAP, Pediatric Infectious Diseases; J. Lawrence Merritt II, MD, FAAP, Clinical Genetics and Biochemical Genetics; Chuck Norlin, MD, FAAP, Pediatrician; Robert E. Sapién, MD, MMM, FAAP, Pediatric Emergency Medicine; Richard Shiffman, MD, FAAP, Partnership for Policy Implementation Representative; Michael B.H. Smith, MB, FRCPCH, FAAP, Hospital Medicine; Jack Percelay, MD, MPH, FAAP, Liaison, Society for Hospital Medicine

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Financial Disclosures/Conflicts of Interest

All authors have filed conflict of interest statements with the American Academy of Pediatrics (AAP). Any conflicts have been resolved through a process approved by the Board of Directors. All panel members declared potential conflicts on the basis of the AAP policy on Conflict of Interest and Voluntary Disclosure. Subcommittee members repeated this process annually and upon publication of the guideline. All potential conflicts of interest are listed at the end of the original guideline document.

Guideline Status

This is the current release of the guideline.

All clinical practice guidelines from the American Academy of Pediatrics automatically expire 5 years after publication unless reaffirmed, revised, or retired at or before that time.

This guideline meets NGC's 2013 (revised) inclusion criteria.

Guideline Availability

Available from the American Academy of Pediatrics (AAP) Policy Web site .

Availability of Companion Documents

The following are available:

Tieder JS, Bonkowsky JL, Etzel RA, Franklin WH, Gremse DA, Herman B, Katz ES, Krilov LR, Merritt JL 2nd, Norlin C, Percelay J, Sapién RE, Shiffman RN, Smith MB, Subcommittee on Apparent Life Threatening Events. Brief resolved unexplained events (formerly apparent life-threatening events) and evaluation of lower-risk infants. Executive summary. Pediatrics. 2016 May;137(5):e1-3. Available from the American Academy of Pediatrics (AAP) Policy Web site .

Brief resolved unexplained events (formerly apparent life-threatening events) and evaluation of lower-risk infants. Supplemental information. Pediatrics 2016 May;137(5):S11-8. Available from the AAP Policy Web site .

Tieder JS, Altman RL, Bonkowsky JL, Brand DA, Claudius I, Cunningham DJ, DeWolfe C, Percelay JM, Pitetti RD, Smith MB. Management of apparent life-threatening events in infants: a systematic review. J Pediatr. 2013;163(1):94-9, e91-6. Available from the Journal of Pediatrics Web site .

Patient Resources

The following is available:

Brief resolved unexplained events: what parents and caregivers need to know. Patient education handouts. Available in English and Spanish from the American Academy of Pediatrics (AAP) Web site.

Please note: This patient information is intended to provide health professionals with information to share with their patients to help them better understand their health and their diagnosed disorders. By providing access to this patient information, it is not the intention of NGC to provide specific medical advice for particular patients. Rather we urge patients and their representatives to review this material and then to consult with a licensed health professional for evaluation of treatment options suitable for them as well as for diagnosis and answers to their personal medical questions. This patient information has been derived and prepared from a guideline for health care professionals included on NGC by the authors or publishers of that original guideline. The patient information is not reviewed by NGC to establish whether or not it accurately reflects the original guideline's content.

NGC Status

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